

Drought Management in Water Supply Planning

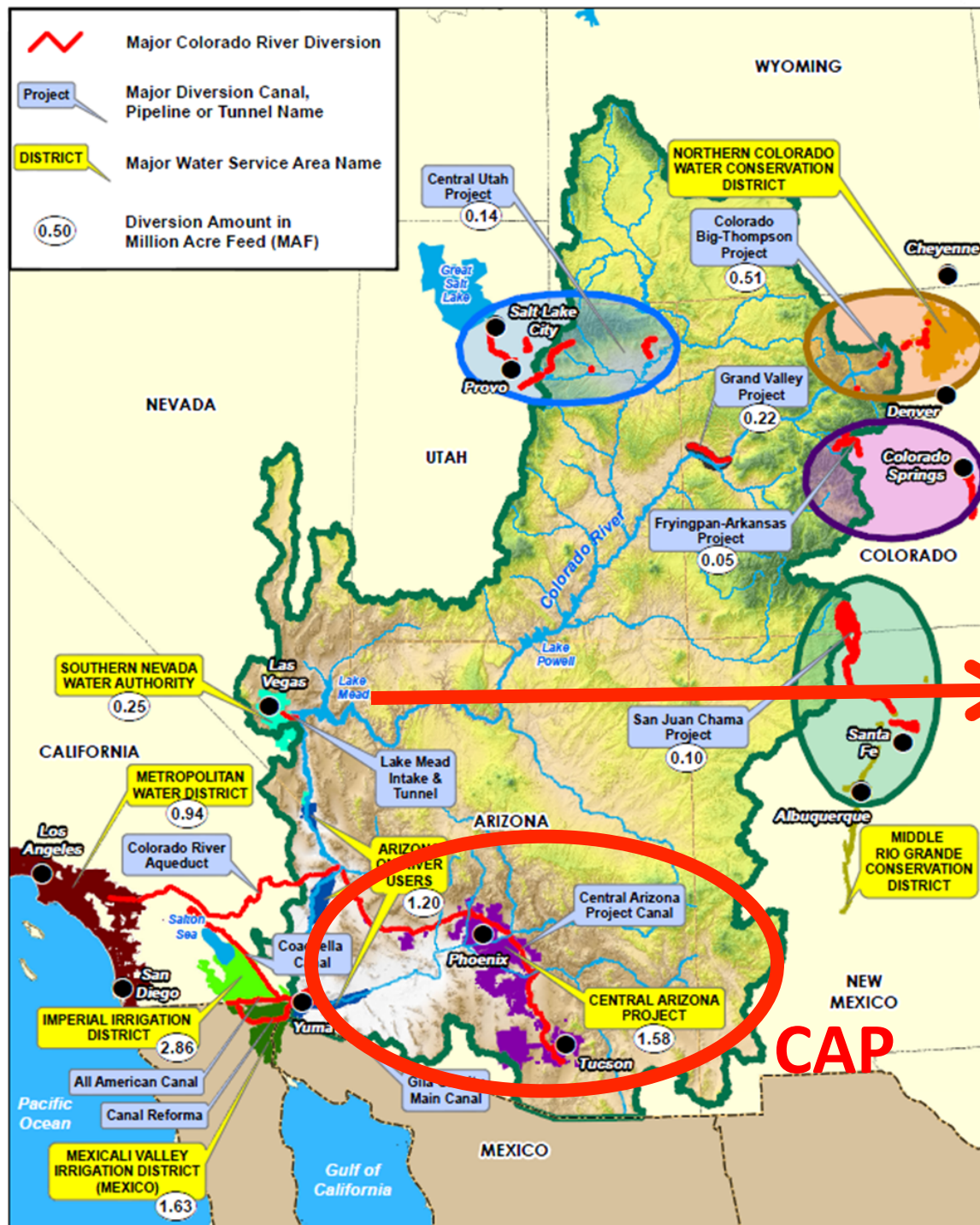
Mohammed Mahmoud, PhD
Planning Analyst
Colorado River Programs

Drought and Climate
Outlook Workshop

October 25th 2016
Denver, CO



YOUR WATER. YOUR FUTURE.



DROUGHT?

92% of annual Colorado River flow occurs in the Upper Basin

Upper Colorado River Basin	
Colorado	51.75%
New Mexico	11.25%
Utah	23.00%
Wyoming	14.00%



Lake Mead (Hoover Dam)

Lower Colorado River Basin	
Arizona	2,800,000 AF
California	4,400,000 AF
Nevada	300,000 AF
Mexico	1,500,000 AF

2007 Interim Guidelines: Shortage Sharing

- Arizona and Nevada share Lower Basin shortages under the 2007 Guidelines (through 2026)
- Mexico voluntarily agreed in Minute 319 to accept reductions in its deliveries at the same elevations

Lake Mead Elevation	Arizona Reduction	Nevada Reduction	Mexico Reduction
1075'	320,000 AF	13,000 AF	50,000 AF
1050'	400,000 AF	17,000 AF	70,000 AF
1025'	480,000 AF	20,000 AF	125,000 AF

- No reductions to California under 2007 Guidelines

1. Pilot Drought Response Action MOU

- Voluntary development of water in Lake Mead
- Reduce risks of reaching critically low elevations in Lake Mead
- Creation of Protection Volumes in 2014-2019 by CAP, USBR, SNWA, MWD



12 Ag Participants

Tonopah IDD
Roosevelt WCD
Queen Creek IDD
New Magma IDD
Hohokam IDD
Maricopa-Stanfield IDD
Central Arizona IDD
Kai Farms
BKW Farms
Maricopa Water District
Salt River Project
Yuma Mesa IDD (on-River)

4 Cities

Glendale
Peoria
Phoenix
Scottsdale



CAP Cooperative MOU Programs

CAP Agricultural customers in Central Arizona

- Ag Forbearance for reduced rate/charge
- Flexibility in using other water supply sources

Yuma Mesa Irrigation and Drainage District

- Pilot program with CAGRD
- Compensation for fallowing of irrigation acres



CAP Municipal Customers

- Received local supply in lieu of CAP delivery (CAP credits with Salt River Project)
- No cost to CAP



2. Pilot System Conservation Program

- System conservation programs effective in partially mitigating drought impacts
- Water users compensated for voluntary reductions in water use
- Funding provided by CAP, USBR, SNWA, MWD, Denver Water

Project Selection Criteria:

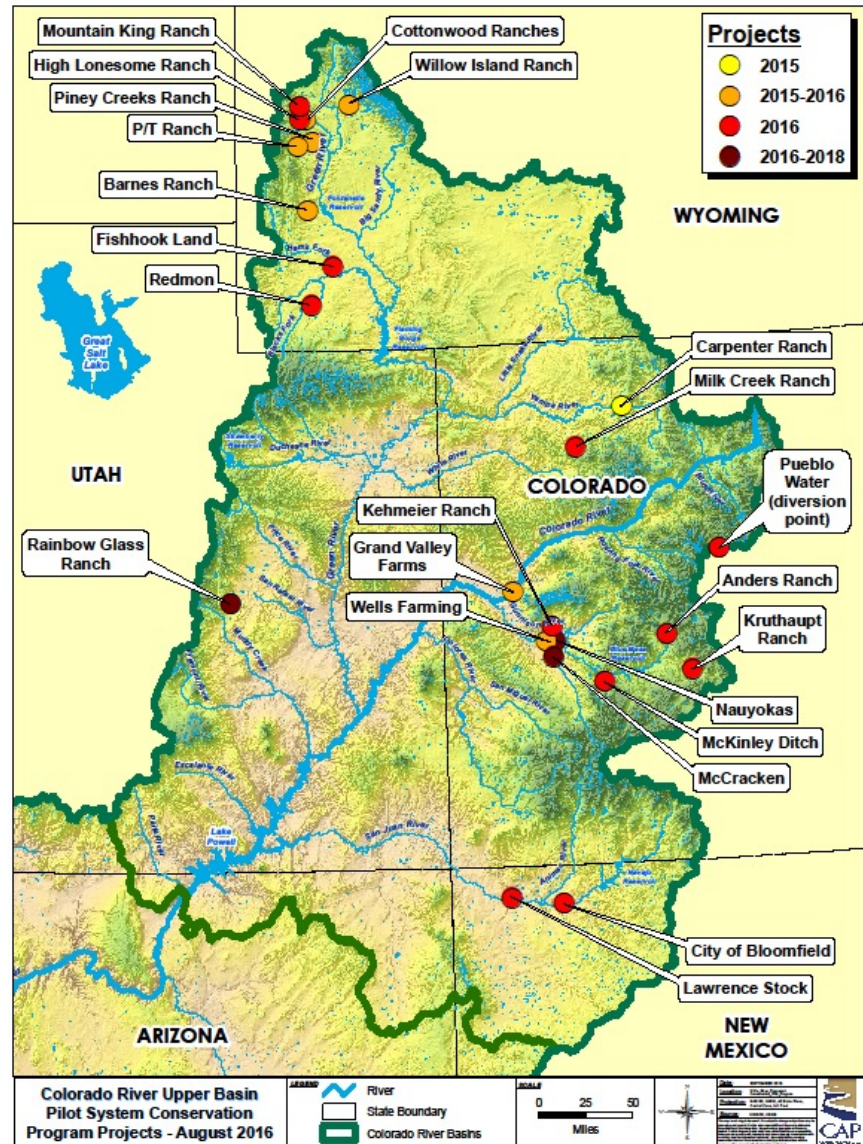
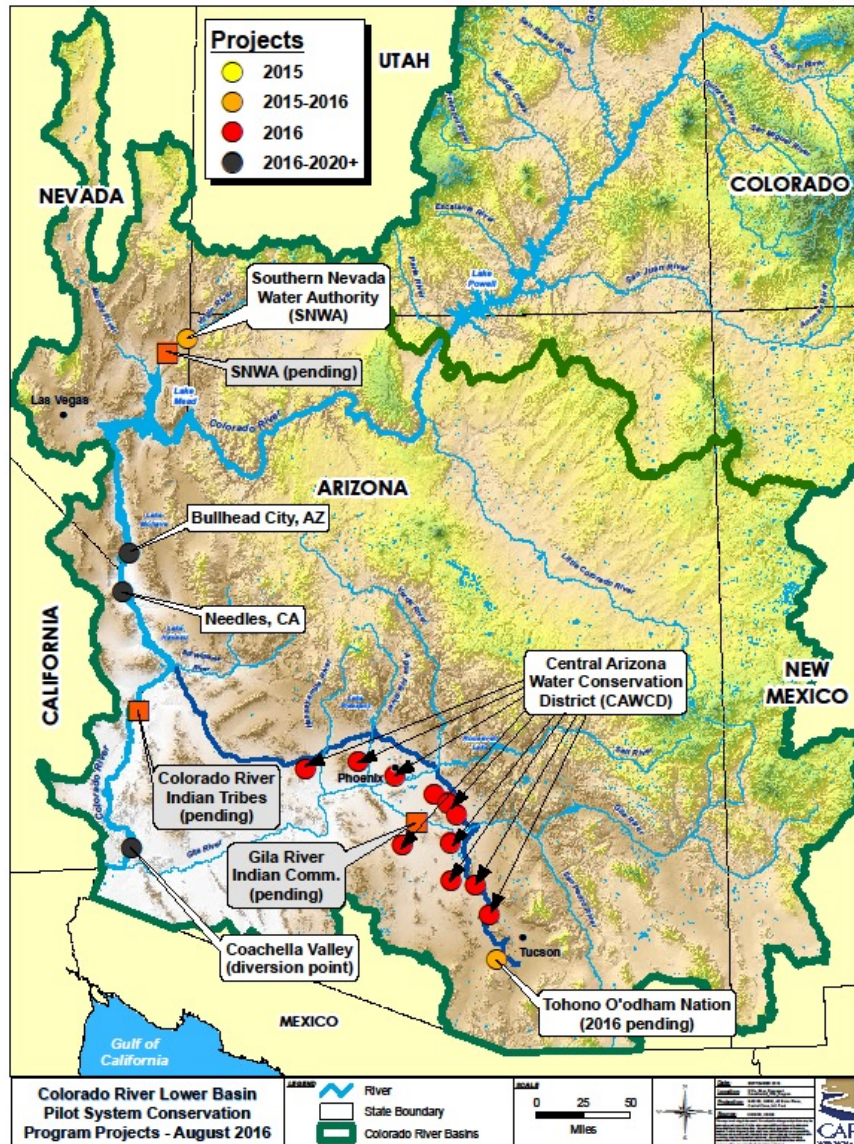
- Geographic diversity – Upper and Lower Basin
- \$/AF proposal to create system conservation
- Diversity in water use sector (Ag, M&I, etc.)
- Ease of implementation
- Minimal 3rd party impacts
- Degree of conservation certainty and verification
- Opportunities to test new and innovative approaches



SOUTHERN NEVADA
WATER AUTHORITY



Pilot System Conservation Projects



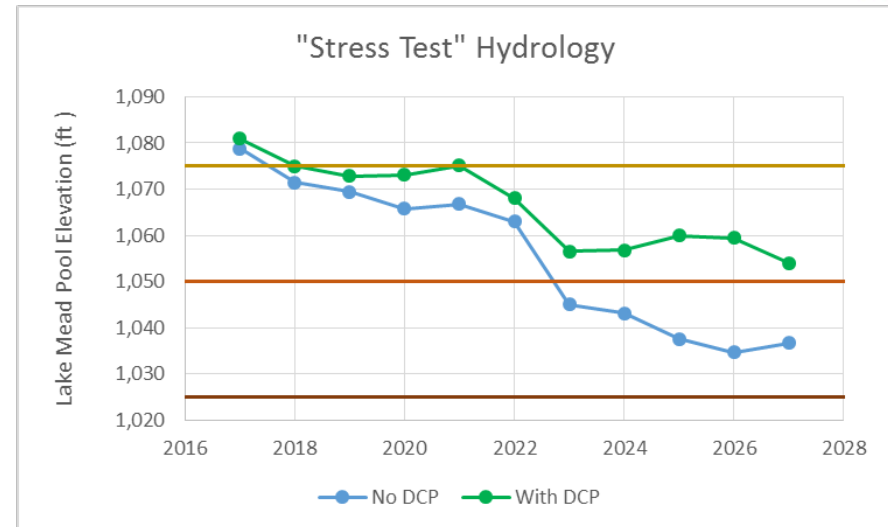
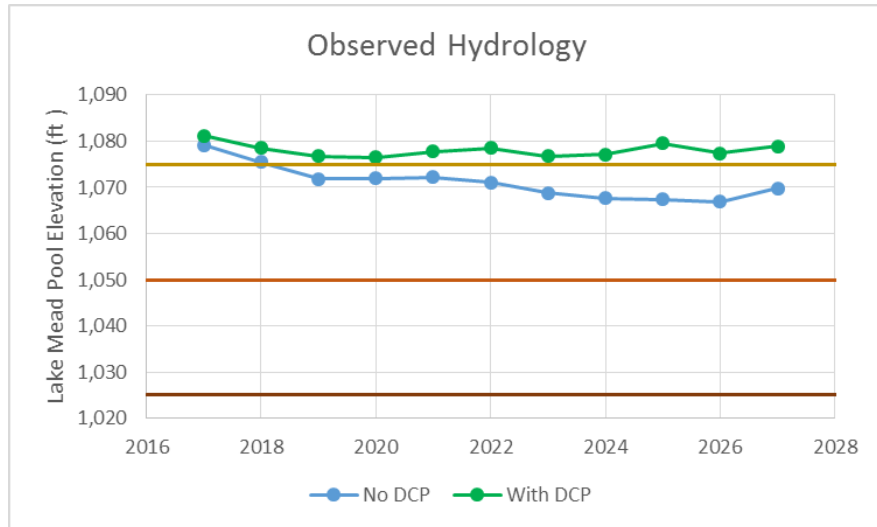
3. Drought Contingency Plan (DCP):

Lake Mead Elevation (Feet)	AZ Reduction (AF)	NV Reduction (AF)	CA Reduction (AF)	USBR Reduction (AF)	Total (AF)
1,090 - 1,075	192,000	8,000	0	100,000	300,000
1,075 - 1,050	192,000	8,000	0	100,000	300,000
1,050 - 1,045	192,000	8,000	0	100,000	300,000
1,045 - 1,040	240,000	10,000	200,000	100,000	550,000
1,040 - 1,035	240,000	10,000	250,000	100,000	600,000
1,035 - 1,030	240,000	10,000	300,000	100,000	650,000
1,030 - 1,025	240,000	10,000	350,000	100,000	700,000
< 1,025	240,000	10,000	350,000	100,000	700,000

- Proposal developed by USBR and the LB states
- Aims to minimize the decline in Lake Mead
- Earlier, deeper, and pro-active reductions
- Provides more certainty and protection of Colorado River supplies



Modeling Results:



- **With DCP:** No Tier 1 shortage
- **Without DCP:** Tier 1

- **With DCP:** No Tier 2 shortage
- **Without DCP:** Tier 2 shortage

Hydrology	No DCP	With DCP
Observed	2019 (Tier 1)	No Shortage
Stress Test	2018 (Tier 1) 2023 (Tier 2)	2019 (Tier 1)

Support Data:

USBR

- 24 Month Study
- Decree Accounting
- Model Updates: CRSS and MTOM

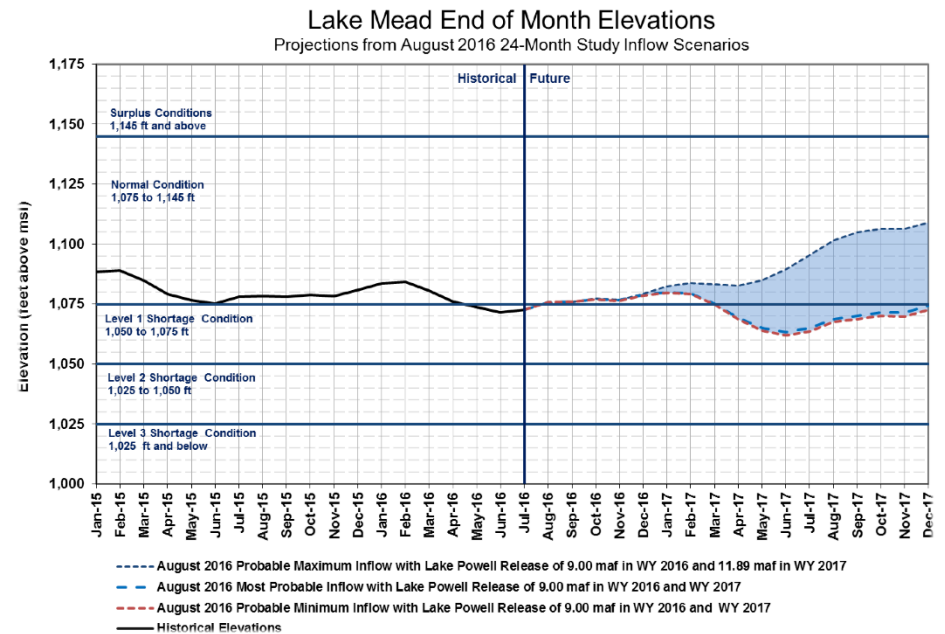
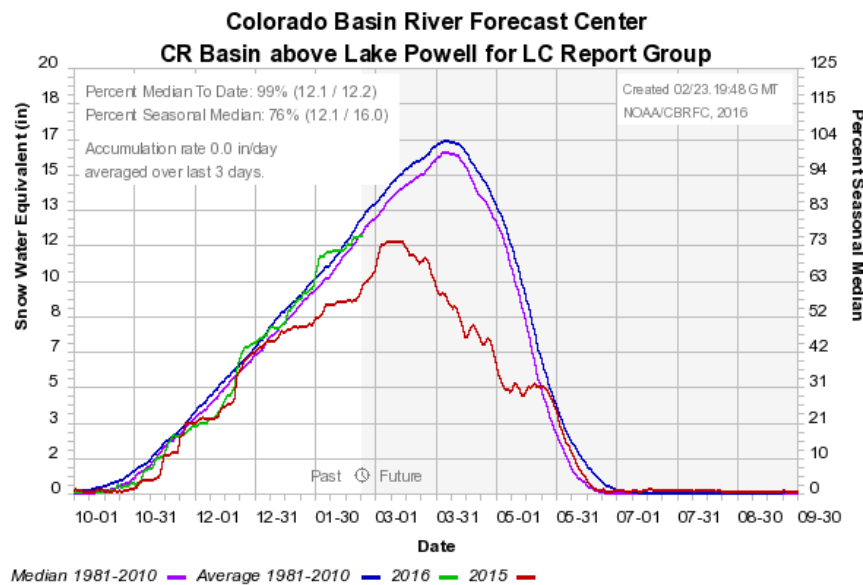
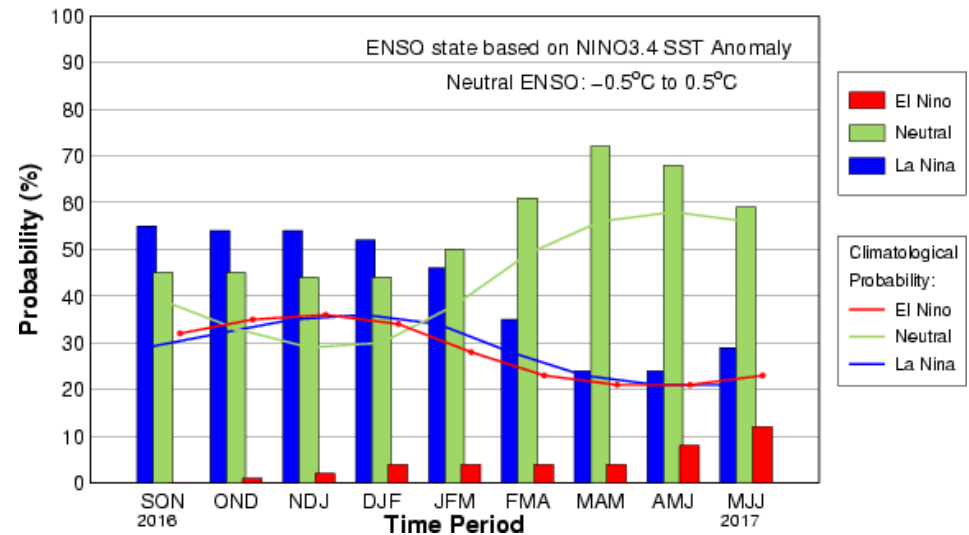
CBRFC

- SWE Chart
- Seasonal Runoff
- Precipitation and Temperature Outlook

Other

- ENSO Outlook

Mid-Sep IRI/CPC Model-Based Probabilistic ENSO Forecast





CAP

CENTRAL ARIZONA PROJECT

YOUR WATER. YOUR FUTURE.

PROTECT
LAKE MEAD

